MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2020/2021

BQT1614 – QUANTITATIVE ANALYSIS

(All Sections/Groups)

30 OCTOBER 2020
9.00 am – 12.00 pm
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consist of **ELEVEN (11) pages** (excluding the cover page).

2. Answer **ALL** questions. The marks distributions are given in parentheses.

3. The Formulae Sheet and the Statistical Tables are provided.

QUESTION 1 [20 MARKS]

a) A sample of the number of delivery orders received per day before and during Movement Control Oder (MCO) from a delivery service provider is as follows:

Before	99	101	80	81	92	84	88	83	81	78
During	105	115	125	102	99	135	122	119	110	101

i) Determine the mean and median for the number of delivery orders received per day before and during MCO.

[6 marks]

ii) Determine the variance and coefficient of variation for the number of delivery orders received per day before and during MCO.

[7 marks]

iii) Based on the results of (i) and (ii), what conclusions can you reach concerning the number of delivery orders received per day before and during MCO?

[2 marks]

b) A sample of 30 delivery orders from a delivery service provider gives a mean delivery time of 28 minutes with a standard deviation of 8 minutes. Find the 95% confidence interval for the mean delivery time of the delivery service provider.

[5 marks]

QUESTION 2 [20 MARKS]

a) The KSS construction company has submitted two bids, one to build a large hotel in Kuala Lumpur and the other to build a commercial office building in Cyberjaya. The company believes that it has 45% chance of winning the hotel bid and 30% of winning the office building bid. The company also believes that winning the hotel bid is independent of winning the office building bid. What is the probability that

i) the company will win at least one contract?

[2 marks]

ii) the company will lose both contracts?

[2 marks]

Continued…

b) A manufacturing firm has two suppliers for an electronic component used in its process: one in Mexico and one in Japan. The supplier in Mexico ships 72% of all the electronic components used by the firm and has a defective rate of 5%. The Japanese supplier ships 28% of the electronic components used by the firm and has a defective rate of 6%. An electronic component is chosen and found to be defective, what is the probability that the component was shipped from Japan.

[4 marks]

c) High street banks all over the world have increased their credit checking methods and as a result, the number of customers coming to the bank who already exceeded their credit limit has increased significantly. New records indicate that this probability is now 0.07. Suppose that on a day, 20 customers visit the branch of a single high street bank.

i) What are the mean and standard deviation of the number of customers exceeding their credit limits?

[2 marks]

ii) What is the probability that at least one customer will exceed his or her limit?

[3 marks]

d) Many manufacturing problems involve the matching of machine parts, such as shafts that fit into a valve hole. A particular design requires a shaft with a diameter of 22mm, but shafts with diameters between 21.99mm and 22.010 mm are acceptable. Suppose that the manufacturing process yields shafts with diameters are normally distributed with a mean of 22.002mm and a standard deviation of 0.005mm. For this process, what is

i) the probability that a shaft is acceptable?

[3 marks]

ii) the diameter that will be exceeded by only 2% of the shafts?

[4 marks]

Continued…

QUESTION 3 [20 MARKS]

a) A sample of 1565 men and a sample of 1791 women were used to compare the amount of housework done by women and men in dual-earner marriages. The study showed that 69.5% of the men felt the division of housework was fair and 62.8% of the women felt the division of housework was fair. Is the proportion of men who felt the division of housework was fair greater than the proportion of women who felt the division of housework was fair? Test at 0.05 significance level.

[12 marks]

b) Annie's Nursery specializes in custom-designed landscaping for residential areas. The estimated labour cost associated with a particular landscaping proposal is based on the number of plantings of trees, shrubs and so to be used for the project. For cost-estimating purposes, managers use two hours of labour time for the planting of a medium size tree. Actual times (in hours) from a sample of 10 plantings during the past month is as follows:

1.9	1.7	2.8	2.4	2.6	2.5	2.8	3.2	1.6	2.5

Using 0.01 level of significance, test whether the mean tree-planting time exceeds two hours.

[8 marks]

Continued…

QUESTION 4 [20 MARKS]

William Andrews, a consultant for Victory Motorcycles has designed a test to show the company's supervisors on the effects of over supervising their workers. A worker from assembly line needs to perform a series of complicated tasks. During the worker's performance, a supervisor constantly interrupts as to assist the worker in completing the tasks. After completing the tasks, a worker will be tested to measure his or her hostility toward authority. The following data was provided as to measure the relationship between two variables:

Number of times for a worker had been interrupted	The score on hostility test
5	58
10	41
10	45
15	27
15	26
20	12
20	16
25	3

a) Identify the independent and dependent variables.

[2 marks]

b) Using the least-squares method, determine the regression line equation for the above relationship between the two variables.

[6 marks]

c) Interpret the meaning of the slope coefficient obtained in (b).

[2 marks]

d) Predict the scoring of hostility test if the number of times which the workers had been interrupted is set at 13 times using the regression line obtained in (b). Is the estimation reliable? Explain.

[4 marks]

e) Calculate the coefficient of correlation and interpret its meaning.

[4 marks]

f) Determine the coefficient of determination and interpret its meaning.

[2 marks]

Continued…

QUESTION 5 [20 MARKS]

a) Che Kow buys a house for RM450,000 with 20% down payment. He takes a loan from a bank to settle the balance. The bank charges him an interest rate of 4.8% compounded monthly. He is required to pay equal monthly payments for thirty years to settle the loan.

i) Calculate the monthly payment and the total interest charged. [7 marks]

ii) If he fails to pay the first three monthly payments, calculate the amount he has to pay on the fourth payment in order to settle the outstanding arrears.

[3 marks]

b) In 10 years, a RM 40 000 machine will have a salvage value of RM 4 000. A new machine at that time is expected to sell for RM 52 000. In order to provide funds for the difference between the replacement cost and salvage value, a sinking fund is set up into which equal payments are placed at the end of each year. If the fund earns 7% compounded annually, how much should each payment be?

[5 marks]

c) A manufacturer purchases three machines to use for its manufacturing process. Information on the price of the three machines and the quantity purchased are given below:

Machine	2005		2015	
	Price ($)	Quantity	Price ($)	Quantity
RC-33	620.49	3200	712.54	8600
SM-14	761.23	4500	833.87	7300
WB-57	904.97	46200	1060.11	38600

i) Determine the unweighted aggregate price Index for these three machines in the year 2015 by using the year 2005 as the base year.

[2 marks]

ii) Determine the Laspeyres aggregate price Index for these three machines in the year 2015 by using the year 2005 as the base year.

[3 marks]

End of questions.

APPENDIXES:

I. STATISTICAL FORMULAE

A. DESRIPTIVE STATISTICS

Sample mean: $\overline{X} = \frac{\sum x}{n}$

Sample standard deviation: $S = \sqrt{\frac{\sum x^2}{n-1} - \frac{(\sum x)^2}{n(n-1)}}$

Coefficient of variation (sample): $CV = \frac{S}{\overline{X}} \times 100\%$

Pearson coefficient of skewness: $S_K = \frac{3(\overline{X} - Median)}{S}$

B. PROBABILITY

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A \cap B) = P(A) \times P(B)$ if A and B are independent

$P(A \mid B) = P(A \cap B) \div P(B)$

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = np and variance = VAR(X) = npq where q = 1- p

Normal Distribution

If X follows a Normal distribution N(μ , σ) where E(X) = μ and VAR(X) = σ^2

then $Z = \frac{X - \mu}{\sigma}$

C. CONFIDENCE INTERVAL ESTIMATION AN SAMPLE SIZE DETERMINATION

$(100-\alpha)\%$ Confidence Interval for Population Mean:

If σ known, μ: $\overline{x} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

If σ unknown, μ: $\overline{x} \pm t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}$

$(100-\alpha)\%$ Confidence Interval for Population Proportion, π: $p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$

Sample Size Determination for Population Mean: $n = \left(\frac{(Z_{\alpha/2})\ \sigma}{e}\right)^2$

Sample Size Determination for Population Proportion: $n = \frac{(Z_{\alpha/2})^2 \pi(1-\pi)}{e^2}$

Continued……

D. HYPOTHESIS TESTING

One Sample Mean Test

***Z*-test:** $Z = \dfrac{\bar{x} - \mu}{\dfrac{\sigma}{\sqrt{n}}}$ ***t*-test:** $t = \dfrac{\bar{x} - \mu}{\dfrac{s}{\sqrt{n}}}$

One Sample Proportion Test

$$Z = \frac{p - \pi}{\sqrt{\dfrac{\pi(1-\pi)}{n}}}$$

Two Sample Mean Test

***Z*-test**: $$Z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\dfrac{\sigma_1^2}{n_1} + \dfrac{\sigma_2^2}{n_2}}}$$

***t*-test**: $$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p\sqrt{\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} \quad \text{where} \quad s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

Two Sample Proportion Test

$$Z = \frac{(p_1 - p_2) - (\pi_1 - \pi_2)}{\sqrt{\bar{p}(1-\bar{p})\left[\dfrac{1}{n_1} + \dfrac{1}{n_2}\right]}} \quad \text{where} \quad \bar{p} = \frac{x_1 + x_2}{n_1 + n_2}; \quad p_1 = \frac{x_1}{n_1}; \quad p_2 = \frac{x_2}{n_2}$$

E. REGRESSION ANALYSIS

Simple Linear Regression

$y_i = b_0 + b_1 x_i$ where $b_0 = \bar{Y} - b_1\bar{X}$ and $b_1 = \dfrac{\sum XY - \left[\dfrac{\sum X \sum Y}{n}\right]}{\left[\sum X^2 - \left(\dfrac{(\sum X)^2}{n}\right)\right]}$

ANOVA Table for Regression

Source	Degrees of Freedom	Sum of Squares	Mean Squares
Regression	*1*	SSR	MSR = SSR/1
Error/Residual	*n – 2*	SSE	MSE = SSE/(*n – 2*)
Total	*n – 1*	SST	

Test Statistic for Significance of the Predictor Variable

$t_i = \dfrac{b_i}{S_{b_i}}$ and the critical value = $\pm t_{\alpha/2,(n-p-1)}$

where *p* = number of predictor

Continued……

F. INDEX NUMBERS

Simple Price Index $P = \frac{p_t}{p_0} \times 100$	**Simple Aggregate Price Index** $P = \frac{\sum p_t}{\sum p_0} \times 100$
Laspeyres Quantity Index $P = \frac{\sum p_0 q_t}{\sum p_0 q_0} \times 100$	**Paasche Quantity Index** $P = \frac{\sum p_t q_t}{\sum p_t q_0} \times 100$
Laspeyres Price Index $P = \frac{\sum p_t q_0}{\sum p_0 q_0} \times 100$	**Paasche Price Index** $P = \frac{\sum p_t q_t}{\sum p_0 q_t} \times 100$
Fisher's Ideal Price Index $\sqrt{(Laspeyres Price Index)(Paasche Price Index)}$	**Value Index** $V = \frac{\sum p_t q_t}{\sum p_0 q_0} \times 100$

G. FINANCIAL MATHEMATICS

Simple Interest

Interest: $I = \Pr t$

Accumulated amount: $A = P(1 + rt)$

Compounded Interest

Accumulated amount: $A = P(1 + i)^n$

Present Value: $P = A(1 + i)^{-n}$

Interest: $I = P(1 + i)^n - P$

Effective rate of interest

$r_e = \left(1 + \frac{r}{m}\right)^m - 1$

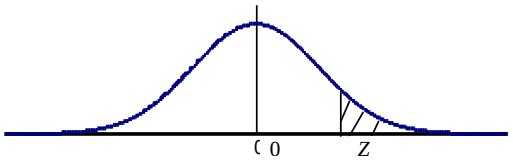
Sinking Fund $R = \left[\frac{Si}{(1+i)^n - 1}\right]$	**Amortization** $R = \left[\frac{Pi}{1-(1+i)^{-n}}\right]$
Future Value of an Annuity $A = R\left[\frac{(1+i)^n - 1}{i}\right]$	**Present Value of an Annuity** $P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$

Continued……

II. STATISTICAL TABLE

Table 1

The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

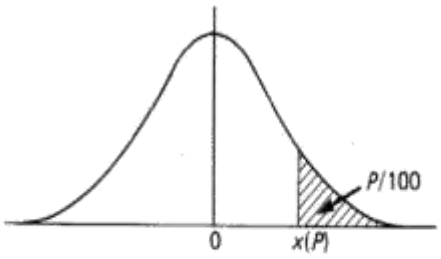
Continued……

TABLE 5. PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

This table gives percentage points $x(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{2\pi}} \int_{x(P)}^{\infty} e^{-\frac{1}{2}t^2}\, dt.$$

If X is a variable, normally distributed with zero mean and unit variance, $P/100$ is the probability that $X \geqslant x(P)$. The lower P per cent points are given by symmetry as $-x(P)$, and the probability that $|X| \geqslant x(P)$ is $2P/100$.



P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$
50	0·0000	**5·0**	1·6449	**3·0**	1·8808	**2·0**	2·0537	**1·0**	2·3263	**0·10**	3·0902
45	0·1257	**4·8**	1·6646	**2·9**	1·8957	**1·9**	2·0749	**0·9**	2·3656	**0·09**	3·1214
40	0·2533	**4·6**	1·6849	**2·8**	1·9110	**1·8**	2·0969	**0·8**	2·4089	**0·08**	3·1559
35	0·3853	**4·4**	1·7060	**2·7**	1·9268	**1·7**	2·1201	**0·7**	2·4573	**0·07**	3·1947
30	0·5244	**4·2**	1·7279	**2·6**	1·9431	**1·6**	2·1444	**0·6**	2·5121	**0·06**	3·2389
25	0·6745	**4·0**	1·7507	**2·5**	1·9600	**1·5**	2·1701	**0·5**	2·5758	**0·05**	3·2905
20	0·8416	**3·8**	1·7744	**2·4**	1·9774	**1·4**	2·1973	**0·4**	2·6521	**0·01**	3·7190
15	1·0364	**3·6**	1·7991	**2·3**	1·9954	**1·3**	2·2262	**0·3**	2·7478	**0·005**	3·8906
10	1·2816	**3·4**	1·8250	**2·2**	2·0141	**1·2**	2·2571	**0·2**	2·8782	**0·001**	4·2649
5	1·6449	**3·2**	1·8522	**2·1**	2·0335	**1·1**	2·2904	**0·1**	3·0902	**0·0005**	4·4172

Continued……

TABLE 10. PERCENTAGE POINTS OF THE t-DISTRIBUTION

This table gives percentage points $t_\nu(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{\nu\pi}} \frac{\Gamma(\frac{1}{2}\nu+\frac{1}{2})}{\Gamma(\frac{1}{2}\nu)} \int_{t_\nu(P)}^{\infty} \frac{dt}{(1+t^2/\nu)^{\frac{1}{2}(\nu+1)}}.$$

Let X_1 and X_2 be independent random variables having a normal distribution with zero mean and unit variance and a χ^2-distribution with ν degrees of freedom respectively; then $t = X_1/\sqrt{X_2/\nu}$ has Student's t-distribution with ν degrees of freedom, and the probability that $t \geqslant t_\nu(P)$ is $P/100$. The lower percentage points are given by symmetry as $-t_\nu(P)$, and the probability that $|t| \geqslant t_\nu(P)$ is $2P/100$.

The limiting distribution of t as ν tends to infinity is the normal distribution with zero mean and unit variance. When ν is large interpolation in ν should be harmonic.

P	40	30	25	20	15	10	5	2·5	1	0·5	0·1	0·05
$\nu = 1$	0·3249	0·7265	1·0000	1·3764	1·963	3·078	6·314	12·71	31·82	63·66	318·3	636·6
2	0·2887	0·6172	0·8165	1·0607	1·386	1·886	2·920	4·303	6·965	9·925	22·33	31·60
3	0·2767	0·5844	0·7649	0·9785	1·250	1·638	2·353	3·182	4·541	5·841	10·21	12·92
4	0·2707	0·5686	0·7407	0·9410	1·190	1·533	2·132	2·776	3·747	4·604	7·173	8·610
5	0·2672	0·5594	0·7267	0·9195	1·156	1·476	2·015	2·571	3·365	4·032	5·893	6·869
6	0·2648	0·5534	0·7176	0·9057	1·134	1·440	1·943	2·447	3·143	3·707	5·208	5·959
7	0·2632	0·5491	0·7111	0·8960	1·119	1·415	1·895	2·365	2·998	3·499	4·785	5·408
8	0·2619	0·5459	0·7064	0·8889	1·108	1·397	1·860	2·306	2·896	3·355	4·50	5·041
9	0·2610	0·5435	0·7027	0·8834	1·100	1·383	1·833	2·262	2·821	3·250	4·29	4·781
10	0·2602	0·5415	0·6998	0·8791	1·093	1·372	1·812	2·228	2·764	3·169	4·144	4·587
11	0·2596	0·5399	0·6974	0·8755	1·088	1·363	1·796	2·201	2·718	3·106	4·025	4·437
12	0·2590	0·5386	0·6955	0·8726	1·083	1·356	1·782	2·179	2·681	3·055	3·930	4·318
13	0·2586	0·5375	0·6938	0·8702	1·079	1·350	1·771	2·160	2·650	3·012	3·852	4·221
14	0·2582	0·5366	0·6924	0·8681	1·076	1·345	1·761	2·145	2·624	2·977	3·787	4·140
15	0·2579	0·5357	0·6912	0·8662	1·074	1·341	1·753	2·131	2·602	2·947	3·733	4·073
16	0·2576	0·5350	0·6901	0·8647	1·071	1·337	1·746	2·120	2·583	2·921	3·686	4·015
17	0·2573	0·5344	0·6892	0·8633	1·069	1·333	1·740	2·110	2·567	2·898	3·646	3·965
18	0·2571	0·5338	0·6884	0·8620	1·067	1·330	1·734	2·101	2·552	2·878	3·610	3·922
19	0·2569	0·5333	0·6876	0·8610	1·066	1·328	1·729	2·093	2·539	2·861	3·579	3·883
20	0·2567	0·5329	0·6870	0·8600	1·064	1·325	1·725	2·086	2·528	2·845	3·552	3·850
21	0·2566	0·5325	0·6864	0·8591	1·063	1·323	1·721	2·080	2·518	2·831	3·527	3·819
22	0·2564	0·5321	0·6858	0·8583	1·061	1·321	1·717	2·074	2·508	2·819	3·505	3·792
23	0·2563	0·5317	0·6853	0·8575	1·060	1·319	1·714	2·069	2·500	2·807	3·485	3·768
24	0·2562	0·5314	0·6848	0·8569	1·059	1·318	1·711	2·064	2·492	2·797	3·467	3·745
25	0·2561	0·5312	0·6844	0·8562	1·058	1·316	1·708	2·060	2·485	2·787	3·450	3·725
26	0·2560	0·5309	0·6840	0·8557	1·058	1·315	1·706	2·056	2·479	2·779	3·435	3·707
27	0·2559	0·5306	0·6837	0·8551	1·057	1·314	1·703	2·052	2·473	2·771	3·421	3·690
28	0·2558	0·5304	0·6834	0·8546	1·056	1·313	1·701	2·048	2·467	2·763	3·408	3·674
29	0·2557	0·5302	0·6830	0·8542	1·055	1·311	1·699	2·045	2·462	2·756	3·396	3·659
30	0·2556	0·5300	0·6828	0·8538	1·055	1·310	1·697	2·042	2·457	2·750	3·385	3·646
32	0·2555	0·5297	0·6822	0·8530	1·054	1·309	1·694	2·037	2·449	2·738	3·365	3·622
34	0·2553	0·5294	0·6818	0·8523	1·052	1·307	1·691	2·032	2·441	2·728	3·348	3·601
36	0·2552	0·5291	0·6814	0·8517	1·052	1·306	1·688	2·028	2·434	2·719	3·333	3·582
38	0·2551	0·5288	0·6810	0·8512	1·051	1·304	1·686	2·024	2·429	2·712	3·319	3·566
40	0·2550	0·5286	0·6807	0·8507	1·050	1·303	1·684	2·021	2·423	2·704	3·307	3·551
50	0·2547	0·5278	0·6794	0·8489	1·047	1·299	1·676	2·009	2·403	2·678	3·261	3·496
60	0·2545	0·5272	0·6786	0·8477	1·045	1·296	1·671	2·000	2·390	2·660	3·232	3·460
120	0·2539	0·5258	0·6765	0·8446	1·041	1·289	1·658	1·980	2·358	2·617	3·160	3·373
∞	0·2533	0·5244	0·6745	0·8416	1·036	1·282	1·645	1·960	2·326	2·576	3·090	3·291

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